

CSE 410 Assignment 5

Spring 2008

Due: Midnight, Friday 5/16/2008

Submit all of your files via Catalyst Collect it. Please do not forget to comment your codes and put you name and UWNetID in every file you submitted.

<https://catalysttools.washington.edu/collectit/dropbox/telmas/2218>

Updated:

05/12/2008

05/15/2008

1. a) Patterson & Hennessy, 7.9
b) Patterson & Hennessy, 7.10
2. (Based on Silberschatz 9.4)
Suppose we have a computer that has a virtual memory space of 2^{32} bytes. The computer has 2^{22} bytes of physical memory. The virtual memory is implemented by paging and the page size is 4,096 bytes. Now, assume that a user process generates the virtual address 17,567,965 (decimal). Explain how the system establishes the corresponding physical location. What part of the translation is done purely in hardware and what part depends on software?
3. Patterson & Hennessy, 7.39
4. Patterson & Hennessy, 7.52

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5. Assume that you are given an array of integers that is bigger than the available cache and the content of the array is located in the cache with non-zero values. Let $read(N)$ be command that read the array entry in the cache at index N and does the appropriate address translation. It will return the requested value and indicate whether it is a miss or a hit and it will do the necessary block replacement. Thus, you conduct the following operations on the cache:

Operation	Hit/Miss	Action
read(0)	Hit	
read(256)	Hit	
read(512)	Hit	
read(768)	Hit	
read(1024)	Miss	Block replaced
read(256)	Hit	
read(1380)	Miss	Block replaced
read(512)	Hit	
read(1536)	Miss	Block replaced
read(768)	Hit	
read(1892)	Miss	Block replaced
read(1024)	Hit	
read(2048)	Miss	Block replaced
read(0)	Miss	Block replaced
read(1536)	Hit	

- a) Based on the operation above, what can you infer on the size of the cache? Justify your answer. Assume that valid and dirty bits and the tag do not occupy space in the cache, or in other words, they exist but do not compromise the space in the cache.
- b) What can you tell about the type of the cache? Justify your answer?
 (Hint: it can be direct-map, fully-associative, or 4-way-set associative; it can be more than one possibilities)
- c) **Extra Credit:** If we are given another mystery cache, what would be the best way to know the size of the cache? Your answer can be in the form of pseudo-code or simply thoughtful arguments.